QMSS LLD

Release Notes

Applies to Product Release: 02.01.00.16
Publication Date: July 17, 2018

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Contents

Release Notes

QMSS LLD version 02.01.00.16

Overview

This document provides the release information for the latest QMSS Low Level Driver which should be used by drivers and application that interface with QMSS IP.

QMSS LLD module includes:

- Compiled library (Big and Little) Endian of QMSS LLD.
- Source code.
- API reference guide
- Design Documentation

LLD Dependencies

LLD is dependent on following external components delivered in PDK package:

- CSL
- CPPI LLD
- RM LLD

New/Updated Features and Quality

Release 2.1.0.15

- Updated buildlib.xs to have Rules.make from ti/build to be included for the component builds.

Release 2.1.0.15

- Added new APIs (Qmss_programDDRBarrierQueue, Qmss_programMSMCBarrierQueue), firmware and tests/benchmarks for memory barrier functionality, CATREQ-1532.

Release 2.1.0.14

- Update linux usermode LLDs for K2 devices on new LTS linux and toolchain.

Release 2.1.0.13

- Added K2G support

<u>Release 2.1.0.12</u>

- Add Keystone II A15 lib and test/example support
- Added Keystone I lib and test/example support
- Updated RTSC script to support device specific lib build

This is an **engineering release**, tested by the development team.

<u>Release 2.1.0.11</u>

- QoS Update:
    - Update "qos_sched" to support simultaneous bytes and packets for CIR and PIR. Add stats query for entire group at a time. C level backwards compatibility. Code that directly pokes registers needs to be updated.
    - Update "qos_sched_wide" to have stats query for entire group at a time. Otherwise, backwards binary register API.
    - Add executable C model project (qmQosFwCModel*) which is run on DSP #1, together with qmQosSchedCModel* which is run on DSP #0. This further validates that C model and firmware and unit test are all identical.
    - Add documentation for QoS firmware to docs\firmware.
- Prevent general use of queues 4095, 8191, 12287 and 16383, because they are reserved by hardware from use as return queues with CPPI. They are removed from RM policy and are masked out inside qmss. They can still be opened by number.
- Add NEON instructions to Qmss_queuePush() to do atomic 64 bit push without a proxy.
- Linux examples and tests connect to new RM Server socket interface
- Add test case with 25Kpps with size set to 0 for QoS. Fix issue in firmware which only affects packet size 0 that capped output at 10K or 20Kpps (1 packet per tick).

<u>Release 2.1.0.10</u>

- Update arm examples to use **cached** cmem. Requires at least cmem 4.10.00.01. Update to handle fact that IO virtual address is not same as real physical address.
- Changed device specific shared library soname to a common name.
- Update sriortr firmware (1.0.0.1) to implement read-after-write fence on modified descriptors.

<u>Release 2.1.0.9</u>

- Added new RM OSAL functions to tests and examples.
- Coverity cleanup for two issues that would never affect normal operation.

<u>Release 2.1.0.8</u>

- Change usermode LLD examples (qmInfraDmaMC/SC) to use UIO/CMA instead of /dev/mem and hardcoded MSMC addresses. Add qpend queues to avoid busywaiting.

This requires using uio, cmem, and dts patches (already in linux) in order to run the example.

- Add new API, Qmss_openMemoryRegion() which registers a region that was already inserted from a different context/global object. This allows multiple contexts (tasks, or tasks and dsp cores) to use one region of descriptors.
- Add "sriortr" firmware, that enables routing of type11 packets by modifying src/destid based on route tag in first 32 bits of payload.

<u>Release 2.1.0.7</u>

- Add qos_sched_wide QoS which is like qos_sched (2 full ports with 5 groups of 8 queues and 10 lite ports) but only has 1 full port with 17 groups of 8 queues, associated changes to LLD to control it, and a test project qmQosSchedWideK2?C66BiosTestProject. The existing qos fw and API are identical/backwards compatible.
- Fix race in accumulator APIs where status/results of message was checked outside semaphore/critical section.

<u>Release 2.1.0.6</u>

- Fix qmInsMemRegion for user mode on k2h/k2k because # of linux descriptors grew.
- Update Qos Scheduler firmware to use a different scaling (fixed point) shift for wrr credits than for cir/pir credits. The firmware now expects 3 fewer bits of shift for wrr credits, which means if user code is NOT changed, the wrr scheduling will be 8 times more course (eg switching between ratios 8 times slower). This difference is not observable in most test equipment. Also Linux takes care of this, so no change is required if Linux is used to manage QoS via device tree.
    - Added 10000:1 ratio test case which is new requirement that led to this change. User can use Qmss_convertQosSchedWrrPackets() and Qmss_convertQosSchedWrrBits() to do the scaling for wrrInitialCredit (instead of Qmss_convertQosSchedPacketRate() and Qmss_convertQosSchedBitRate()). Can also use QMSS_QOS_SCHED_WRR_PACKETS_SCALE_SHIFT or QMSS_QOS_SCHED_WRR_BYTES_SCALE_SHIFT to directly shift credits.
- Reordered register writes in Qmss_insertMemoryRegion so that region is enabled (by writing base address) after the other registers are programmed.

<u>Release 2.1.0.5</u>

- Fix qmInsMemRegion for user mode on k2l/k2e.
- Fix Qmss_queueOpen() when queType == QMSS_PARAM_NOT_SPECIFIED and queue > 8192. It would fail with error code -151.

<u>Release 2.1.0.4</u>

- Add support for QoS "lite joint ports" which enables groups of 8WRR by joining together two neighboring lite ports into one larger port.

- Added ARMv7 libraries that include precompiled qmss_device.c.
    - usr/lib/libqmss.a/so do not contain precompiled qmss_device.c. User application should compile qmss_device.c with any necessary customizations and use this library.
    - usr/lib/libqmss_k2[hkle].a/so contains precompiled qmss_device.c for the specified device. This should not be used together with user-compiled qmss_device.c in order to avoid duplicate symbols from linker.
- Added device library support (precompiled qmss_device.c) into DSP libraries (lib/k2*/c66/ti.drv.qmss.a*).
- Added error check to accumulator for list size. This prevents overruns that lead to strange accumulator behavior.
- Add Qmss_internalVirtToPhy for accumulator listAddress.
- Clean coverity warnings.
- Allow startIndex for memory regions to be allocated anywhere dynamically (QMSS_START_INDEX_NOT_SPECIFIED), internal linking RAM (QMSS_START_INDEX_INTERNAL) or external linking RAM (QMSS_START_INDEX_EXTERNAL). This requires RM DTS update to differentiate between internal and external. The qmssInsRegionTest.out will fail on linux until linux resolves SDOCM00106347.
- Add missing queue types for k2e and k2l.
- Removed cslr_device.h and csl_qm_queue.h from everything except qmss_device.c. This removes device dependence from common library and application code which includes qm header files. This may break an application which should have included cslr_device.h, but magically worked due to free dependence from qm. Application should be modified to include cslr_device.h itself.
- This release also includes resolved IPs as listed at section "Resolved Incident Reports (IR)"

Release 2.1.0.3

- Put Qmss_getMemRegQueueHandleSubSys as public API instead of internal because some library cleanup code needs it. Add Qmss_getMemRegQueueHandle.
- Sync with 2.0.0.18

Release 2.1.0.2

- Sync with 2.0.0.13

Release 2.1.0.1

- Add versions of each API that doesn't take a QueueHnd to accept a Qmss_SubSysHnd. This allows each API to interact with the secondary queue manager inside the netss. Also, moved the virt/phy translation from OSAL to a function pointer in the qmss_device.c, so each SubSys can have different pointers. Defaults in qmss_device.c and wrapper functions allow existing code to use the global (system level) queue manager without any change.

Release 2.0.0.18

- Put “far” attributes on qmssLObjIsValid for those projects who recompile sources without –mem_model:data=far.

Release 2.0.0.17

- Moved qmssLObjIsValid to “.far:local” and added a --mem_model:data=far to enable moving qmssLObjIsValid away from rest of near data. This only affects scalars in the library which are not part of data path.

Release 2.0.0.16

- Added section tags “.neardata:local” to qmssLObjIsValid and “.far:local” to qmssLObj. This allows the user to force these sections to a local/private memory when .far and .neardata are put in a shared/nonprivate memory. No action is required by user if .far and .neardata are still private.
- Added removeBytes field to qos scheduler and qos scheduler + drop scheduler. This allows shaping of L3/L4 traffic by removing cost of lower level headers from qos accounting. Note: please ensure all C registers get populated on all relevant “push” operations before using this parameter. Typically, but not required, offsetBytes will be set to 0 when removeBytes is used.
- Add writeback for qmssGObj in Qmss_init(). This has no effect when qmssGObj is placed in MSMC because L1D is read-allocate. It is required to support qmssGObj placed in L2 cacheable memory such as DDR, since L2 cache is write-allocate.

Release 2.0.0.15

- Added Qmss_openAccumulatorCh, Qmss_cfgAccumulatorCh, Qmss_stopAccumulatorCh, and Qmss_closeAccumulatorCh. This separates resource management (open/close) from configuration (cfg/stop) enabling cfg/stop to be called from realtime code (while open/close are called from non-realtime code). Note Qmss_programAccumulator and Qmss_disableAccumulator still exist and bundle the resource management and configuration together, which has more latency than configuration alone.

Release 2.0.0.14

- Add shared object library support

Release 2.0.0.13

- Add RM to remaining user mode examples (qmInsRegionTest, qmSCfgTest, qmDescTest, and qmDcfgTest) and removed internal resource management from defines in qmss_test.h.
- Fix error exit in Qmss_insertMemoryRegion. If any resources are taken before error is detected, they are returned to RM after the error is dectected.
- Fix error exit in Qmss_insertMemoryRegion for RM errors. It previously exited with open critical section which would result in crash if critical section is mapped in the osal.

- Add Qmss_QueueType_INTC_SET[234]_QUEUE to add all INTC(CIC) accessible queues.
- Add Install for qmInfraDmaMC.out so it can appear in yocto/arrago filesystems.
- Add error check in Qmss_start and Qmss_startCfg to return error if Qmss_init() has not been called on the global object.
- Fix Qmss_getStarvationCount(s) for starvation queues on second QM.
- Add Qmss_setEoiVectorByIntd, Qmss_ackInterruptByIntd in order to address the second intd (to allow second accumulator). Added second INTD/accumulator to RM and qmss_device.c.
- Change logic for returning isAllocated when using rm, such that it will return 0, 1, and 2 like without rm. However, it may return a different value for >=2 depending on whether multiple instances of qmss LLD are created (such as when using ARM user mode). If there is single owner count (DSP only) it works like without RM. However if there are multiple owners, it returns owner count instead of reference count. Note: this may change to a global reference count in a future release.
- Note: when using RM, the queType field to Qmss_queueOpen MUST be correct. It can be either a valid queue type, or QMSS_PARAM_NOT_SPECIFIED. Do not hardcode to other constants such as 0, because those are otherwise legal queue types.

Release 2.0.0.12

- Remove initialization of qmQueMgmtProxyDataReg (which isn't currently used by LLD) from k2h/k2k because that memory area doesn't exist in hw.
- Cleans up if partial group allocation (Qmss_rmServiceGroups) fails.
- Added Qmss_exit() to clean up the "control" and "linking ram" resources in RM.
- Modify Qmss_insertMemoryRegion to allocate link RAM index via RM so it is globally accounted.
- Modify Qmss_init to not reject due to RM linking ram permissions when initCfg.qmssHwStatus = QMSS_HW_INIT_COMPLETE. This allows "clean" init when ARM set up linking RAM.
- Integrate RM into examples and unit test from ARM (qmQAllocTest.out, qmInfraDmaSC.out, qmInfraDmaMC.out). This requires starting rm server with following command line:
    - rmServer.out rm/device/k2h/global-resource-list.dtb rm/device/k2h/policy_dsp_arm.dtb
- The following guidelines can help migrate code to support all 16K queues.
    - When using CPPI keep using Qmss_getQueueNumber and make sure you don't discard qMgr field.

    - Otherwise, use Qmss_getQIDFromHandle to the the unmutilated 16-bit queue number. This should be used when passing to TI firmware such as the packet accelerator or QoS.
    - The following grep can help inspect user code for 16K queue problems:
        - egrep -r -n --include='*.[ch]' "qMgr|qNum" .
            - If you see qMgr+qNum on adjacent lines the code is good.
            - If you see a qMgr=0 and qNum on adjacent lines the code is forcing to work on first 4K queues and can probably be readily extended to use all 16K.
            - If you see a qNum without a qMgr, you should use the Qmss_getQIDFromHandle APIs instead (assuming the lh part of expression is not CPPI otherwise make sure both qMgr+qNum are used).
- Add new API Qmss_queueOpenUse which only opens the queue if it has already been opened somewhere else.
- Fix RM integration in Qmss_queueOpenInRange(). It would always return the first queue in the range whether or not it was already open.

Release 2.0.0.11

- Added starvation counter and high priority queues to second QM. Updated qmInfraK2*BiosExampleProject to use those new queues in one of its test cases.
- Add new API Qmss_removeMemoryRegion() to assist with making projects restartable.
- Make examples and unit tests work on both DSP and ARM
    - Note: in order to run on ARM, it requires loading and activating kernel module which opens memory protection for the QM/CPPI to user space. This must be done once per boot of EVM.

```
insmod hplibmod.ko
cat /proc/netapi
```

- Make all QM and CPPI examples " restartable" from the ARM. This means each can be run sequentially (or multiple times) without rebooting the EVM.

Release 2.0.0.10

- Fully integrated Keystone II RM. If RM Server Handle equals NULL the LLD will operate in backwards compatibility mode as if RM does not exist.
    - QMSS QosSched and QosSchedDropSched projects updated to use RM.
    - QMSS InfraMC example project updated to use RM.

Release 2.0.0.9

- Add two new API: Qmss_getQIDFromHandle() and Qmss_getHandleFromQID() which are used to convert between Queue ID that are used by other hardware, and queue handles used by the LLD.

- Add new API: Qmss_getStarvationCounts() which queries a group of 4 starvation counters, since hw clears all 4 even if sw only asked for 1.
- Fix NULL push in qos scheduler firmware and update its version number to 2.0.1.5.

<u>Release 2.0.0.8</u>

- Aligned Resource Manager callouts with new Keystone II RM APIs. Only RM Service Handle equals NULL has been tested with LLD.

<u>Release 2.0.0.7</u>

- Synchronize with keystone 1. Rebase to 1.0.3.19 from 1.0.2.16 (see below).
- Remove cppi_types.h/qmss_types.h since LLDs use c99 types. No longer need to add ti/drv/qmss and ti/drv/cppi as include paths.

<u>Release 2.0.0.6</u>

- Fixed errors found in user mode LLDs example/test projects building.

<u>Release 2.0.0.5</u>

- Bug fixes. See Resolved Incident Reports section below.
- Renamed the device specific folders as per new naming conventions.
- Support for TCI6636K2H device (k2h).

<u>Release 2.0.0.4</u>

- Updates for using auto-generated cslr_device.h and csl_device_interrupt.h files.

<u>Release 2.0.0.3</u>

- Modification for single LLD library to work for all platforms. Moved the default location of C66x libraries to lib\c66x inside component directory
- Build support for ARMv7 user mode target. Limited build verification in this release.

<u>Release 2.0.0.2</u>

- Update accumulator firmware to allow reclaimation feature to support 16K queues.
- Update qmss_device.c to match realignment of TX queues in the HW specs.
- Rename InfrastructureMode and InfrastructureModeMulticore to InfraDmaSC and InfraDmaMC, respectively, to shorten pathnames.
- Reconfigure InfraDmaSC and InfraDmaMC to use the DMA in the second QM and the first QM, respectively. This insures both DMAs are tested.

<u>Release 2.0.0.1</u>

- Fixed issue with load balancing (queues opened with absolute # were not counted as load)
- Added enum for Qmss_PdspID_PDSP8.
- Update QoS firmware to use 4 bit hint field instead of 5 bits (broke descriptors with addresses aligned to 0x10). (SDOCM00088701)
- Update accumulator firmware to use 4 bit hint field (SDOCM00088702), allow for 16K queues, and use correct base address for diversion feature.

<u>Release 2.0.0.0</u>

- Addition of support for two QM groups on Keystone 2.
    - There are two modes, JOINT and SPLIT.
    - In JOINT mode, descriptors can be pushed onto any of the 16K queues and linking RAM and descriptor regions are automatically added to both groups. Since JOINT_LOADBALANCED is 0, applications who set Qmss_InitCfg to 0 will automatically operate in this mode without other changes relative to Keystone 1. No new APIs are required. While some APIs include a queueGroup in structures, it is always ignored in JOINT mode.
    - There are two schedulers for JOINT mode. ROUND ROBIN strictly alternates between the two QMs while LOADBALANCED adds to the QM with the least open queues.
    - In SPLIT mode, the queueGroup that is added to various configuration structures is used to specify which queue group will be used. A new API, Qmss_queueOpenInGroup() allows the group number to be specified when opening queues. The existing Qmss_queueOpen() API will always allocate from group 0.
    - For debugging purposes its possible to force use of one QM in either split or joint mode by setting (maxQueMgrGroups,maxQueMgr,maxQue) = (1,2,8192) instead of (2,4,16384) in qmss_device.c.
- KeyStone2 devices have new directory structure for devices, example and test folders

Release 1.0.3.19

- Add push proxy feature that allows C+D to be pushed together for devices where errata prevents using the HW proxy.
    - Therefore, the ability to run QoS Scheduler and Drop Scheduler at different rates is removed since it wasn’t required by primary user of QoS Scheduler + Drop Scheduler
    - Push Proxy feature is only available together with drop scheduler, so it won’t slow down QoS Scheduler alone.
- Remove critical section/mutex from Qmss_queuePush() for the c6600, since it is not necessary since it always does atomic 64 bit stores.
- Change all (void *) cast in qmss_device.c into the actual types. This allows qmss_device.c to be compiled with a C++ compiler.

Release 1.0.3.18

- Readback of QoS scheduler ports doesn’t work. This issue was due to an error in memcmp() in test project, and was present in all versions of QoS scheduler.
- QoS Scheduler Drop Scheduler push statistics are changed from interrupt mechanism to queue mechanism. Now, the top level configuration for the drop scheduler can specify up to 4 queue pairs for push stats. Once the MSB of one of the stats becomes set, the stats are

copied into a descriptor taken from the specified queue source, then placed into the queue destination.

- qmQosSchedTestProject fails on BE: Error introduced by drop scheduler, fixed in this release.
- qmQosSchedDropSchedTestProject fails on BE: Error fixed in this release.

Release 1.0.3.17

- Added " drop scheduler" plus " qos scheduler" firmware (which is in qos_sched_drop_sched_le[] and qos_sched_drop_sched_be[]). This firmware supports 20 lite ports of 1 goup of 4 queues together with the drop scheduler which supports a model tail drop and fixed probability RED drop.
- The existing qos scheduler firmware is still supported, and is in qos_sched_le[] and qos_sched_be[]. It is backwards compatible with previous release, except:
    - Added a new parameter outThrotThresh (and outThrotType) that stops a port from outputting packets if the output que has more than the threshold. Setting this to 0 is backwards compatible with previous releases. When nonzero, this allows ports to be cascaded while keeping all dropping at the head of the hierarchy.
    - Added a check on wrrInitialCredit. It must be at least 50 bytes or at least 1 packet. This allows throughput to be optimized. If error is returned, just re-normalize the wrr credits such that the minimum meets the above requirement, and the desired ratios are maintained.
- Resolved issues found by static analysis tool.
- Added a new API Qmss_queueBlockOpen which can allocate a contiguous block of aligned queues. It is used by qmQosSchedTest and qmQosSchedDropSchedTest to allocate its queues.

Release 1.0.3.16

- Add qos scheduler APIs to assist in unit conversion: Qmss_convertQosSchedBitRate() and Qmss_convertQosSchedPacketRate(). These can be used to convert a bit per second rate or packet per second rate to a cir/pir/wrr credit value. Note that the format of the credit value has not changed; existing code that calculates credits themselves will still work as is.
- Add more test cases to qos scheduler unit test. 11 deployment scenarios are implemented in test_qosSchedScen.c. These scenarios are automatically run as part of qmQosSchedTestProject. Note that test_qosSched.c contains a #define QOS_SCHED_FAST_SCENARIO. This causes the new scenarios to run for 1/100th of the configured time in order to speed up regression. This define should be removed to run for the fully specified 1 minute per test case.
- Improve robustness of QoS scheduler firmware to invalid configurations. One invalid configuration was found that leads to an infinite loop.

Release 1.0.3.15

- Update SRIO context tracker firmware and qmss_qos to support 6 garbage queues instead of 5, and to make output garbage queues configurable.
    - In order to do this, added Qmss_QosSrioCfg.garbageRetQs to configure the queues.
    - The firmware queues specified through Qmss_QosSrioCfg.queBase reduced from 32 to 21. The garbage return queues were removed and the tx completion queues moved up. Thus, QMSS_QOS_SRIO*Q_OFFSET were updated.
    - Since firmware was changed, it now exports its version number through scratch, which can now be queried through Qmss_getQosFwVersion().
- Prefix the symbol queueFree to qmssQueueFree to avoid collisions.
- Add multi core critical section around all qmss_qos.c functions that use the firmware's mailbox.

Release 1.0.3.14

- Remove memset() and memcpy() prototypes from qmss_osal.h and replace with #include<string.h> to avoid introducing side effects of removing the prototypes from user code.
- Add Qmss_queuePushDescSizeRaw() and Qmss_queuePopRaw that do not perform address translation. These should only be used by highly optimized applications who manage virtual/physical addresses themselves.
- Add Qmss_getQueuePushHandleCfg() to return the config side address of the queue's D register.

Release 1.0.3.13

- Updated the QoS scheduler firmware and C code. One change is externally visible which is the addition of the Qmss_QosSchedPortCfg.overheadBytes which allows for the Ethernet overhead to be accounted for when scheduling in bytes/bits per second. For example for normal Ethernet frames this would be set to 24 while 0 is backwards compatible with previous versions.
- Additionally, the internal algorithm has been enhanced in the area of weighted round robin handling, robustness to missed timer ticks, and the port scheduler was changed to schedule the CIR of each ports by selecting groups using regular round robin (instead of giving each group its full CIR, potentially starving others)

Release 1.0.3.12

- Remove RM checks from Qmss_ackInterrupt and Qmss_setEoiVector. These checks were redundant to those done when opening the accumulator channel.

Release 1.0.3.11

- Update qmss_device.c for the C6657 device, no functional changes for other devices.

Release 1.0.3.10

- Update firmware for QoS scheduler to fix a crash of the firmware.

Release 1.0.3.9

- Pad qmssGObj to 128 bytes. This prevents the linker from inserting other structures immediately after qmssGObj, which QM would clobber via cache invalidation during its normal operation.

Release 1.0.3.8

- Increase resolution qos scheduler byte credits from a shift of 8 to a shift of 11. This is transparent to user code if QMSS_QOS_SCHED_BYTES_SCALE_SHIFT are used.

Release 1.0.3.7

- Increase number of QoS scheduler lite ports from 6 to 10, increase resolution for packets from a shift of 6 to a shift of 20, and increase resolution for bytes from a shift of 3 to a shift of 8. This is transparent to user code if QMSS_QOS_SCHED_PACKETS_SCALE_SHIFT and QMSS_QOS_SCHED_BYTES_SCALE_SHIFT are used.

Release 1.0.3.6

- Fix doxygen for Qmss_configureQosSrioCluster, Qmss_enableQosSrioCluster, and Qmss_disableQosSrioCluster. No changes to any executable code.

Release 1.0.3.5

- Remove ^Z from bottom of firmware header files which causes compilation problem on Linux. No functional change in any code.

Release 1.0.3.4

- Add SRIO context tracking feature which is in legacy QoS (Qmss_*QosSrioCluster).

Release 1.0.3.3

- Update QoS scheduler firmware to v 1.0.0.2 to fix a minor problem with the pir portion of the scheduler. Greatly enhanced QoS scheduler unit test.

Release 1.0.3.2

- Updated QoS scheduler firmware to v 1.0.0.1 to fix problems with wrong data rates and an infinite loop.

Release 1.0.3.1

- Updated QoS scheduler firmware to fix problems disabling ports and with congestion dropping.

Release 1.0.3.0

- Added a new QoS scheduling algorithm called QoS scheduler. Its unit test/example is in test\test_qosSched.c.

Release 1.0.2.5

- Added an include file in example project to provide platform specific configurations.

Release 1.0.2.4

- Release adds examples and unit test code to demonstrate Linux User Mode LLD usage for ARM processor. Support only applicable for devices with ARM processor.
- Added support for Resource Manager LLD. For all existing applications there are no API modifications required. The Qmss_startCfg API has been added to configure use of the RM LLD if desired.

Release 1.0.2.3

- Fix for hint bits in accumulator and QoS firmware. This caused some functions to fail when descriptors are aligned to 4 bits instead of 5. Only 4 bits are required.
- Update Round Robin QoS firmware to fix scheduling.
- Allow queue numbers > 4095 to be specified to QoS
- Fix Qmss_getStarvationCount() API.

Release 1.0.2.2

- Release includes modifications to support User Mode access for ARM processor. Support only applicable for devices with ARM processor.

Release 1.0.2.1

- Additional device support

Release 1.0.2.0

- Add queue divert feature to accumulator firmware
- Enhance error checking for Qmss_insertMemRegion
- Fix warnings in examples

Release 1.0.1.0

- Add Round Robin Cluster mode to QoS and update QoS firmware.

Release 1.0.0.17

- Added auto generation of LLD version number and Makefile

<u>Release 1.0.0.16</u>

- Replaced XDC types for Endian define with compiler provided options in Qmss_queuePush()
    - "xdc_target__bigEndian" and "xdc_target__littleEndian" is replaced by "_BIG_ENDIAN" and "_LITTLE_ENDIAN"

<u>Release 1.0.0.15</u>

- Changed Qmss_queuePush() API to use 64 bit atomic writes via the DMA SCR instead of using Queue Proxy.
    - Use "xdc_target__bigEndian" flag for Big Endian
    - Use "xdc_target__littleEndian flag for Little Endian
    - Updated "qmss_device.c" to include the DMA SCR address

- Updated QOS and accumulator PDSP firmware files for 16, 32, 48 channel for LE and BE. Fixed bug in reclamation queue for monolithic descriptors which was masking queue number to 2048 instead of 8192
- Updated cache invalidation and writeback OSAL APIs to use mfence. Added XMC prefetch buffer invalidation.

<u>Release 1.0.0.14</u>

- Changes for limiting doxygen requirement only during the release
- Copyright modification to TI BSD
- PDSP firmware change
    - The Accumulator firmware includes an optional reclamation queue which can be used for packet discards. Any descriptor placed on the reclamation queue will be recycled in the same manner as if it had been submitted to CDMA. The descriptor packet information field is used to determine the return queue and the return handling, including options to unlink host descriptors and push to either the front or the back of the return queue. Setting queue to zero disables the reclamation feature
        - Added a new API Qmss_programReclaimQueue().
    - Updated the accumulator PDSP firmware files for 16, 32, 48 channel for LE and BE

<u>Release 1.0.0.13</u>

- Fixed Qmss_queuePopDescSize() API to read the packet size from the status registers instead of management register C.
- Added project txt files to enable auto project creation for example and test projects

<u>Release 1.0.0.12</u>

- Queue Proxy is not modeled in the simulator. Added flag **SIMULATOR_SUPPORT** to handle the unsupported feature in qmss_mgmt.h. Ensure the example and test projects define this flag to differentiate between simulator and device. Pre-built library is compiled with this flag turned off.

Release 1.0.0.11

- C66 Target support
- Modifications to the LLD to be device independent.
    - QMSS API changed from
      Qmss_Result Qmss_init (Qmss_InitCfg *initCfg);
      to
      Qmss_Result Qmss_init (Qmss_InitCfg *initCfg, Qmss_GlobalConfigParams *qmssGblCfgParams);
    - Link device specific file **qmss_device.c** in the driver/application.
    - Add an external reference to device specific configuration
      extern Qmss_GlobalConfigParams qmssGblCfgParams;
    - Changed to enum **qmss_QueueType**

```
Old values
typedef enum
{
    /** Low priority queue */
    Qmss_QueueType_LOW_PRIORITY_QUEUE = 0,
    /** PASS queue */
    Qmss_QueueType_PASS_QUEUE = 640,
    /** INTC pending queue */
    Qmss_QueueType_INTC_QUEUE = 662,
    /** SRIO queue */
    Qmss_QueueType_SRIO_QUEUE = 672,
    /** High priority queue */
    Qmss_QueueType_HIGH_PRIORITY_QUEUE = 704,
    /** starvation counter queue */
    Qmss_QueueType_STARVATION_COUNTER_QUEUE = 736,
    /** Infrastructure queue */
    Qmss_QueueType_INFRASTRUCTURE_QUEUE = 800,
    /** Traffic shaping queue */
    Qmss_QueueType_TRAFFIC_SHAPING_QUEUE = 832,
    /** General purpose queue */
    Qmss_QueueType_GENERAL_PURPOSE_QUEUE = 864
}Qmss_QueueType;

New values

typedef enum
{
    /** Low priority queue */
    Qmss_QueueType_LOW_PRIORITY_QUEUE = 0,
    /** PASS queue */
    Qmss_QueueType_PASS_QUEUE,
    /** INTC pending queue */
    Qmss_QueueType_INTC_QUEUE,
    /** SRIO queue */
    Qmss_QueueType_SRIO_QUEUE,
    /** High priority queue */
    Qmss_QueueType_HIGH_PRIORITY_QUEUE,
    /** starvation counter queue */
    Qmss_QueueType_STARVATION_COUNTER_QUEUE,
    /** Infrastructure queue */
    Qmss_QueueType_INFRASTRUCTURE_QUEUE,
    /** Traffic shaping queue */
    Qmss_QueueType_TRAFFIC_SHAPING_QUEUE,
    /** General purpose queue */
    Qmss_QueueType_GENERAL_PURPOSE_QUEUE
}Qmss_QueueType;
```

  - Added new defines for Queue types. Refer to QMSS section under CSL changes
- Changed the accumulator programming APIs to handle high, low and QOS firmware images
  - Deprecated enum Qmss_AccPriorityType
  - Changed APIs

    Qmss_Result Qmss_programAccumulator (**Qmss_AccPriorityType type**, Qmss_AccCmdCfg *cfg);
    Qmss_Result Qmss_disableAccumulator (**Qmss_AccPriorityType type**, uint8_t channel);
    Qmss_Result Qmss_configureAccTimer (**Qmss_AccPriorityType type**, uint16_t timerConstant);

    To

    Qmss_Result Qmss_programAccumulator (**Qmss_PdspId pdspId**, Qmss_AccCmdCfg *cfg);
    Qmss_Result Qmss_disableAccumulator (**Qmss_PdspId pdspId**, uint8_t channel);
    Qmss_Result Qmss_configureAccTimer (**Qmss_PdspId pdspId**, uint16_t timerConstant);
- Added new API to allocate queues from within a specified range
  - Qmss_QueueHnd Qmss_queueOpenInRange (uint32_t startQueNum, uint32_t endQueNum, uint8_t *isAllocated);
- Added new APIs to get LLD version ID and Version String
  - uint32_t Qmss_getVersion (void);
  - const char* Qmss_getVersionStr (void);

<u>Release 1.0.0.10</u>

- Prebuilt libraries are both ELF and COFF. Examples and test projects are ELF only.
- Added a new API to programs the timer constant used by the PDSP firmware to generate the timer tick. Configurable timer ticks are 10us, 20us and 25us. Default is 25us.

  Qmss_Result Qmss_configureAccTimer (Qmss_AccPriorityType type, uint16_t timerConstant)
- Updated PDSP firmware files to allow configuration of above mentioned timer tick.
- Removed qmss instance count. Make sure the application calls Qmss_init() APIs once. When using multicore application, application MUST provide synchronization between cores such that slave cores wait on master core to finish Qmss_init() before calling Qmss_start() API.
  - An example is provided in "InfrastructureModeMulticore" example.
  - Deprecated error return code **QMSS_ALREADY_INITIALIZED**.
- Added cache coherency hooks.

- Added cache coherency callouts for cache invalidation and writeback. The cache hooks are only in control path. No cache coherency operations are performed in data path.
- OSAL has been modified to add OSAL implementation of callouts for L1 and L2 caches (L2 is commented out right now). Refer to *qmss_osal.h* and infrastructure_multicoreosal.c
- " InfrastructureModeMulticore" has been modified to configure L2 caches and MPAX for address translation. It is currently commented out under **L2_CACHE** define.

- Changed library optimization level from o3 to o2. Removed deprecated option ml3.
- Removed defines **QT** and **QT_WORKAROUND** from examples and test code.
    - Note that PDSP firmware must be downloaded in order to program the accumulator.

Release 1.0.0.9

- Migration of LLD from COFF to ELF. Prebuilt libraries are ELF only.

Release 1.0.0.8

- Added a new macro QMSS_DESC_SIZE(desc) to get the descriptor size if the popped descriptor contains the descriptor size.

  If Qmss_queuePushDescSize() API is used to push a descriptor onto a queue, the descriptor when popped will have the descriptor size information in the lower 4 bits. This macro is provided to obtain the descriptor size information. Minimum size is 16 bytes. Maximum size is 256 bytes
- INTD is modeled in simulator. If you are using accumulator to generate interrupts, you need to acknowledge them after processing in order to receive further interrupts.

```
Qmss_ackInterrupt (cfg.channel, 1);
Qmss_setEoiVector (Qmss_IntdInterruptType_HIGH, cfg.channel);
```

  cfg.channel is the accumulator channel used. Refer to the API documentation for further details.

  Modified examples and test project to remove QT dependency.
- PDSP firmware download intermittently failed in BE mode. Fixed by resetting PDSP' s program counter before enabling and using volatile variables for addressing.
- Changed XDC tools version to 3.16.02.32 in examples and test projects.
- Disabling accumulator channel works correctly as long as all interrupts generated by INTD are acknowledged. Removed QT_WORKAROUND from examples.

- Internal RAM configuration is fixed. The linking RAM address register is configured with internal linking RAM offset instead of absolute address. Removed QT_WORKAROUND from examples.

<u>Release 1.0.0.7</u>

- Modified types from XDC to C99
- Changed all source, header, and example code to reflect CSL include path change in CSL version 1.0.0.13.

<u>Release 1.0.0.6</u>

- This release is for workarounds for issues found during testing. The workarounds are compiled under **QT_WORKAROUND** define.
- The examples are test case are modified for QT. Define **QT** and **QT_WORKAROUND** (defined by default) to run the examples and testcases on QT.
- Internal linking RAM causes CCS to hang. Use external(L2) linking RAM instead.
- Accumulator cannot be disabled. The PDSP firmware does not clear the command causing the API to loop indefinitely.
- Monolithic packets are received with zero packet length. Data and protocol specific data are not present in the received packet.
- Packet length is read as zero when descriptor is popped by reading register C and D.

<u>Release 1.0.0.5</u>

- Modifications to LLD to conform to QMSS 1.0.0 spec
  - Added new type Qmss_IntdInterruptType to acknowledge end of interrupt for QMSS CDMA buffer starvation events
    - API changed from Qmss_Result Qmss_setEoiVector (Qmss_AccPriorityType type, UInt8 interruptNum);

      to

      Qmss_Result Qmss_setEoiVector (Qmss_IntdInterruptType type, UInt8 interruptNum);
  - Added a new macro QMSS_DESC_PTR(desc) to mask off the lower 4 bits of descriptor. If Qmss_queuePushDescSize() API is used to push a descriptor onto a queue, the descriptor when popped will contain the descriptor size information in the lower 4 bits. The macro provided will clear out the size information.

    - Setting of threshold on transmit queues to transmit a packet is not required anymore. Transmit pending queue signal is not hooked to threshold.
    - The linking RAM is now 64 bits wide. Declare the data type accordingly when using external linking RAM.
    - Changed maximum supported packet accelerator subsystem (PASS) queues to 12.
    - PDSP firmware files for accumulator and QoS are dated Jan 20th 2010.
- Added APIs to send commands to program QoS PDSP.

<u>Release 1.0.0.4</u>

- Deprecated API Qmss_getQueuePendingStatus() used to get queue pending status.

<u>Release 1.0.0.3</u>

- Added new API Qmss_getQueueHandle to get queue handle given the queue manager and queue number
- New API is added to pop the packet size along with descriptor address. The API is
  Void Qmss_queuePopDescSize (Qmss_QueueHnd hnd, Ptr *descAddr, UInt32 *packetSize);
- Changed Enum Qmss_QueueType_FFTC_QUEUE to include 2nd instance of FFTC. The new enums are Qmss_QueueType_FFTC_A_QUEUE and Qmss_QueueType_FFTC_B_QUEUE
- Internal linking RAM use is supported. QMSS examples are modified to use internal linking RAM. The same can be done in the application. LLD will configure linking RAM0 address to internal linking RAM address if a value of zero is specified in linkingRAM0Base parameter. LLD will configure linking RAM0 size to maximum internal linking RAM size if a value of zero is specified in linkingRAM0Size parameter
- Device specific sample configuration is built within the driver. They are located within the device directory. There is no need to add/link the file to the project. Remove sample_qmss_cfg.c from example .project files. Remove external reference to sample_qmssGblCfgParams.
- Device specific configuration parameter has been removed from init API. The API has changed to
  Qmss_Result Qmss_init (Qmss_InitCfg *initCfg)
- No need to explicitly include qmss_acc.h. Including qmss_drv.h is sufficient.
- PDSP firmware download during init is now supported. It is untested since simulator does not model the download. The pre-built PDSP firmware images for 16 channels, 32 channels and 48 channel accumulator are packaged in the firmware directory.
- New API to set end of interrupt in INTD module. It is untested since simulator does not model INTD. The API is
  Qmss_Result Qmss_setEoiVector (Qmss_AccPriorityType type, UInt8 interruptNum)
- Modified Infrastructure example to showcase both monolithic and host descriptor use.

Release 1.0.0.2

- A new API is introduced in QMSS LLD. The Qmss_start() API must be called at least once on every core. It initializes the objects local to each core. This must be the first API called immediately after Qmss_init(). In case of a core that does not call Qmss_init() API, Qmss_start() should be the first API called.
- Qmss_insertMemoryRegion() API is modified to return the inserted memory region index when successful.

Release 1.0.0.1

- Added Infrastructure Mode Multicore example to demonstrate data transfer and synchronization between cores.
- Changed OSAL critical section APIs to be more generic

  Instead of passing the key as an input parameter to the enter function (as was previous version), changed it such that OSAL creates the handle instead of the caller. OSAL creates the unique handle in CS enter, handle is a return parameter. From the LLD perspective it is an opaque handle that is passed to the CS exit function.
- QMSS LLD help integrated with the CCSv4 Eclipse Help subsystem

Release 1.0.0.0

- Initial release of low level driver

Resolved Incident Reports (IR)

Table 1 provides information on IR resolutions incorporated into this release.

Table 1 Resolved IRs for this Release

IR Parent/ Child Number	Severity Level	IR Description
SDOCM00121740	Major	qmss & srio user mode lld examples need to be updated to work with updated uio-module-drv

Known Issues/Limitations

IR Parent/ Child Number	Severity Level	IR Description

Licensing

Please refer to the software Manifest document for the details.

Delivery Package

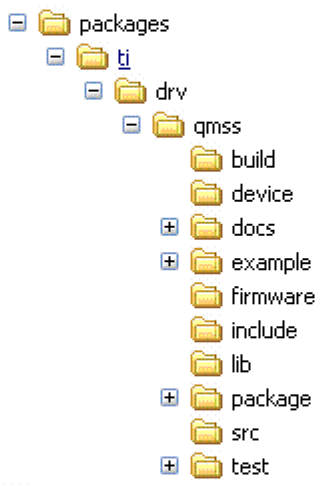
There is no separate delivery package. The QMSS LLD is being delivered as part of PDK.

Installation Instructions

The LLD is currently bundled as part of Platform Development Kit (PDK). Refer installation instruction to the release notes provided for PDK.

Directory structure

The following is the directory structure after the QMSS LLD package has been installed:



```
packages
  ti
    drv
      qmss
        build
        device
        docs
        example
        firmware
        include
        lib
        package
        src
        test
```

The following table explains each individual directory:

Directory Name	Description
`ti/drv/qmss`	The top level directory contains the following:- 1. *Environment configuration batch file* The file "`setupenv.bat`" is used to configure the build

	environment for the QMSS low level driver. 2. *XDC Build and Package files* These files (`config.bld, package.xdc` etc) are the XDC build files which are used to create the QMSS package. 3. *Exported Driver header file* Header files which are provided by the QMSS low level driver and should be used by the application developers for driver customization and usage.
`ti/drv/qmss/build`	The directory contains internal XDC build related files which are used to create the QMSS low level driver package.
`ti/drv/qmss/device`	The directory contains the device specific files for the QMSS low level driver.
`ti/drv/qmss/docs`	The directory contains the QMSS low level driver documentation.
`ti/drv/qmss/example`	The "`example`" directory in the QMSS low level driver has the infrastructure mode example.
`ti/drv/qmss/firmware`	The "`firmware`" directory in the QMSS low level driver has the pre-built PSDP firmware files for accumulator and QoS.
`ti/drv/qmss/include`	The "include" directory has private QMSS low level driver header files. These files should not be used by application developers.
`ti/drv/qmss/lib`	The "`lib`" folder has pre-built Big and Little Endian libraries for the QMSS low level driver along with their *code/data size information*.
`ti/drv/qmss/package`	Internal QMSS low level driver package files.
`ti/drv/qmss/src`	Source code for the QMSS low level driver.
`ti/drv/qmss/test`	The "`test`" directory in the QMSS low level driver has unit test cases which are used by the development team to test the QMSS low level driver.
`eclipse`	The "eclipse" directory has files required to integrate QMSS low level driver documentation with Eclipse IDE's Help Menu.

Customer Documentation List

Table 2 lists the documents that are accessible through the **/docs** folder on the product installation CD or in the delivery package.

Table 2 Product Documentation included with this Release

Document #	Document Title	File Name
1	API documentation (generated by Doxygen)	docs/qmsslldDocs.chm
2	Design Document	docs/CPPI_QMSS_LLD_SDS.pdf
3	Software Manifest	docs/QMSS_LLD_SoftwareManifest.pdf